TRAFFIC MONITORING SITE VEHICLE SPEED/CLASSIFICATION UNIT.
(REV 6-16-99) (FA 7-20-99) (1-10)

PAGE 813. The following new Section is added after Section 715:

SECTION 743
TRAFFIC MONITORING SITE
VEHICLE SPEED/CLASSIFICATION UNIT

743-1 Description.
Furnish and Install Traffic Monitoring Site (TMS) Vehicle Speed/Classification Unit (electronics unit) in the traffic monitoring site cabinet at the location(s) shown in the plans.

743-2 Materials.
Use a Vehicle Speed/Classification Unit currently listed on the Department's Approved Products List (APL) compatible with the other components installed at the traffic monitoring site. Ensure that the Vehicle Speed/Classification Unit and equipment cable(s) are compatible and constructed in accordance with Design Standards.

Ensure that the Vehicle Speed/Classification Unit is marked in accordance with Section 748 and the markings are visible after installation.

The approval process for equipment and/or material(s) used at a traffic monitoring site is covered in Section 748.

743-3 Vehicle Speed/Classification Unit Requirements.
743-3.1 General: The approval process for equipment or material used on a traffic monitoring site is covered in Section 748.

Provide an electronics unit that either outputs data which is totally compatible with the TranStat polling computer system or the vendor must furnish a software module that will convert the data into a format that is totally compatible with the TranStat polling computer system.

Any electronics unit or software submitted for approval must be totally compatible with the Department's polling and processing software, or such software modules as will convert the data into a format that is totally compatible with the Department's polling and processing software must be furnished by the vendor along with the electronics unit. Any substitute software modules submitted must be tested and approved.

The TranStat polling computer will be made available for inspection by prospective Contractors during normal working hours on an "as available" basis.

Each electronics unit operates in an unattended mode, accumulating data for later retrieval by downloading via the polling computer system. Ensure that the electronics unit is capable of downloading data through direct connection with an IBM compatible personal computer (PC), without deleting or marking the files, unless so instructed.

743-3.2 Compatibility: Provide an electronics unit that is totally compatible with the embedded inductive loops and piezoelectric axle sensors in place at the traffic monitoring site. Ensure that each electronics unit is capable of determining the count and classification by type

and speed of all vehicles passing over the existing sensors embedded in the roadway, for both directions of traffic on the roadway.

Provide real time polling software with each electronics unit, capable of operating on a PC using Windows as it's operating system and meeting the following requirements:

(a) Capable of communicating with the Traffic Counter/Classifiers and downloading data via a telephone service either hard line or cellular and producing reports of hourly, weekly, monthly and annual volumes and/or classification data.

(b) Capable of displaying and/or entering operating parameters into the vehicle class/counters, and of allowing the observation or display of traffic volumes in a real time basis in addition to the routine data collection activities required.

(c) Capable of processing and storing all vehicle data retrieved in its routine mode, regardless of the selected parameters.

Provide complete operating procedures with all software.

743-3.3 Functional Requirements: Provide an electronics unit which is fully functional when receiving input from two embedded inductive loops 6 by 6 feet, spaced from 12 to 24 feet apart leading edge to leading edge, with a single piezoelectric axle sensor located between the loops, in each lane of a six lane (minimum) roadway. Ensure that each electronics unit is capable of collecting data from each of the six lanes of traffic in any combination of counts, classification, speed, or direction. Traffic monitoring sites with more than six lanes may use two electronics units that operate with a single modem and a single telephone line. Ensure that each electronics unit can be addressed individually.

Only provide electrical components of solid state design, constructed so that they will not be damaged by jolts and vibrations encountered during shipping and in every day use.

Ensure that all electronics units are functionally identical and interchangeable except as follows:

(a) The electronics unit may be constructed utilizing plug in modules; however, when plug in modules are used each electronics unit must be identical except for the number and type of modules used. Ensure that modules of the same type are identical and interchangeable.

(b) Should more than two electronics units be required in the same cabinet, ensure that each electronics unit has a unique, individual electronics unit number. The electronics unit number must reside in non-volatile memory, so that it is not changed whenever a "cold or warm boot" is performed, nor by a power interruption.

Provide an electronics unit having the capability of obtaining and providing the following:

(a) Volume, speed, classification, and classification by speed data simultaneously.

(b) Volume data by lane

(c) Speed data by lane in a minimum of 11 bins, programmable in 5-mph increments.

(d) Provide classification by lane in vehicle type by axle class in 15 bins (minimum) in accordance with FHWA's Scheme "F".

(e) Ensure that all programs and operating parameters are stored in a non-volatile memory.

Ensure that each electronics unit has the capability of providing "Real Time Monitoring" of volume data by lane or by direction in user selected intervals of as little as 15 minutes, when required, without disrupting the above selected program(s).

Provide an electronics unit capable of communicating directly with a PC or through a modem at a minimum rate of 9,600 bps.

Ensure that the following parameters, as a minimum, are programmable either by direct connection to the electronics unit or via modem:

(1) Four digit site number,
(2) Number of lanes, directions,
(3) Date and time,
(4) Data operating and transmission parameters,
(5) Sensor spacing,
(6) Recording interval,
(7) Vehicle parameter table with axle spacing ranges for each type of vehicle,
(8) Number and range of speed categories, axle and length classifications, and Headway.

Should a piezoelectric axle sensor and/or a loop in one or more lanes fail, the electronics unit must continue to provide the "best" data possible; i.e., speed and/or volume, from the remaining functioning sensors.

Ensure that the sensitivity level for each piezoelectric axle sensor may be individually adjustable by use of software, by both direction connection of a PC and remotely via telemetry.

Ensure that the loop detectors are internal and self-tuning. Ensure that the sensitivity level, along with any additional parameters necessary to prevent "loop crosstalk" for each embedded inductive loop, may be adjusted individually by use of software, both by direction connection of a PC and remotely via telemetry.

Provide a means of introducing a time delay, or "de-bounce" value for ignoring spurious axle signals ("ghost axles") in the electronics unit software.

743-3.4 Power Requirements: Provide an electronics unit which operates from a battery (either internal or external) capable of providing full system functionality for a minimum of ten days without recharge. Provide batteries capable of having their charge maintained by a photovoltaic module of 30 watts under ambient conditions. If an internal battery is required, it must be furnished and included with the electronics unit at no extra cost.

743-4 Mechanical Requirements.

Provide an electronics unit which is modular in design and completely enclosed in a durable housing of either sheet metal, cast aluminum or an alternate approved by the Engineer, with a durable finish. Ensure that the dimensions of the electronics unit enclosure does not exceed 20 by 15 by 10 inches and is compatible with shelf mounting in a Type 4 cabinet.

743-5 Environmental Requirements.

743-5.1 General: Provide an electronics unit which operates as specified when the temperature and humidity ambients inside the controller cabinet are within the following limits:

743-5.2 Ambient Temperature:

(a) The operating ambient temperature range must be between -40 to 140ºF.

(b) The rate of change in ambient temperature must not exceed 63ºF per hour, during which the relative humidity must not exceed 90%.

743-5.3 Humidity: The relative humidity must not exceed 90% over the temperature range of 40 to 109ºF. Above 109ºF, constant absolute humidity must be maintained, which results in the relative humidities shown in the table below. The relative humidities shown in the table below are for dynamic testing:

At 14.6 psi Barometric Pressure		
Dry Bulb ºF	Relative Humidity (%)	Wet Bulb ºF
40	75	37
50	80	46
60	83	57
70	86	66
80	87	77
90	89	88
100	89	97
109	90	108
120	70	109
130	50	109
140	38	109
150	28	109
160	21	109
165	18	109

743-6 Cables and Connectors.

Furnish all cables and connectors for a complete and functional installation for each electronics unit. Ensure that the equipment cable provided with each electronics unit is capable of connecting to the J1 receptacle mounted in the traffic monitoring site cabinet, as shown in the Design Standards, Index No. 17900. Provide an equipment cable capable of connecting to two J1 receptacles when the electronics unit is to monitor more than four lanes and up to eight lanes of traffic. Ensure that the cables are properly terminated for the prescribed use without further modification by the Department. Furnish one serial port cable for interconnecting each electronics unit with a PC.

743-7 Installation Requirements.

Install the Vehicle Speed/Classification Unit and equipment cable(s) in accordance with the manufacturer's recommended installation procedure and Contract Documents.

743-8 Guaranty Provisions.

743-8.1 Contractor's Responsibility: Secure all guaranties that are customarily issued by the equipment manufacturers for the specific equipment included in the Contract. Ensure that the form in which such guaranties are delivered includes the provision that they are subject to transfer to the Department, and is accompanied by proper validation of such fact. Transfer guaranties at final acceptance of the work (or equipment) by the Department.

743-8.2 Terms: Ensure that the manufacturers of the equipment stipulate the terms of guaranties when submitting a request to the Department for certification and for equipment submittal for construction projects. Include terms for a specified service performance with provisions for repair parts and labor, or for replacement. Provisions shall define the equipment "installation date" as the date for such guaranty to be in effect. For construction projects, the "installation date" is the first day of equipment "burn-in". For warehouse purchases, the "installation date" is the date of visual inspection approval, not to exceed ten days after delivery date.

743-8.3 Conditions: When guaranty is available, ensure that a written and signed guaranty accompanies the manufacturer's billing invoice. The Engineer will sign and retain the original and provide a copy to the manufacturer. If the Contractor does not comply with the terms of the guaranty, the Department may suspend the certification. Comply with additional terms and conditions as stated in purchasing agreements.

743-9 Method of Measurement.

743-9.1 General: Measurement for payment will be in accordance with the following tasks.

743-9.2 Furnish and Install: The Contract unit price per assembly for Vehicle Speed/Classification Unit, furnished and installed, includes the Vehicle Speed/Classification Unit and equipment cable, all equipment, materials and labor necessary for a complete and accepted installation.

743-9.3 Furnish: The Contract unit price per assembly for Vehicle Speed/Classification Unit, furnished, includes the Vehicle Speed/Classification Unit and all mounting hardware as specified in the Contract Documents, plus all shipping and handling costs involved in delivery as specified in the Contract Documents.

743-9.4 Install: The Contract unit price per assembly for Vehicle Speed/Classification Unit installed, includes all miscellaneous materials and labor necessary for a complete and accepted installation. The Engineer will supply the Vehicle Speed/Classification Unit and/or components as specified in the Contract Documents.

743-9.5 Modify: The Contract unit price per assembly for Vehicle Speed/Classification Unit modified, as specified in the Contract Documents, includes all labor, equipment and miscellaneous materials necessary for a complete and acceptable installation.

743-10 Basis of Payment.

Prices and payments will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 743- 70-   TMS Vehicle Speed/Classification Unit - per assembly.